

This document is for customers who have an IP4700 NAS storage device system and want to use backup software with it. While it is beyond the scope of this document to explain how to use the Legato™ NetWorker® and Veritas NetBackup™ applications, it provides tips and supplemental information for configuring and using these third-party backup applications with the IP4700 system. It also presents the unique aspects of your backup environment. The procedures in this document are guidelines, rather than precise, step-by-step instructions. Use this document in conjunction with your NetBackup or NetWorker documentation and your IP4700 documentation. For the Legato NetWorker documentation, see <http://www.legato.com/support/documentation/manuals>. For the Veritas NetBackup documentation, see your NetBackup CD-ROM media.

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This document assumes the following:

- NetBackup 3.4 DataCenter server software and the Network Data Management Protocol (NDMP) option, or NetWorker V6.0.1-001 with **nsrndmp_recover** is installed on your system. (For more information about NDMP, see your backup software documentation.)
- The network is configured properly.
- Your IP4700 system is properly configured on the network, including hostname resolution.
- The EMC NDMP license is installed on your IP4700 system.
- The EMC SnapView/IP license is installed on your IP4700 system if you are using Snap Copy or Fast Incremental.

For information on installing the NetBackup software, refer to the *Veritas NetBackup 3.4 for NDMP System Administrator's Guide*. For information on installing the NetWorker software, see <http://www.legato.com/support/documentation/manuals> and select the Installation Guide for your backup server operating system.

Backup Terminology

While most of the terms in the following table are generic backup terms, some are specific to Legato NetWorker.

Term	Definition
Backup	To copy data from a backup client to backup media; also to write meta-data to the backup server.
Backup client	A computer system that has data to back up. In the context of backup, computer systems typically referred to as servers, for example, application servers and database servers, are referred to as clients.
Backup data	Data that is owned by backup clients, and that must be copied to backup media for data protection. Backup data can be files, file systems, or databases.
Backup media	Storage media (typically magnetic tape), which holds backup data.
Backup server	A server running backup software, which controls the flow of backup data from backup clients to the backup media. In some configurations the backup data may flow through the backup server.

Term	Definition
Backup software	The software running on the backup server that controls the flow of backup data from backup clients to the backup media. Also, backup agent software usually runs on the backup clients.
Catalog or Index	A collection of meta-data that identifies the details of a backup, for example, the names of the clients backed up, the names, file sizes, and dates of the data backed up, and the location of the files on the backup media. Used to restore files.
Client parallelism	The number of sessions that a particular client can send to the NetWorker server.
Dedicated tape drive	A tape drive within a library that is statically and permanently associated with one backup client. A shared tape drive is one that is dynamically and temporarily associated with a backup client.
Fibre Channel to SCSI bridge	A device that connects one or more Fibre Channel (FC) links to one or more SCSI buses. The primary purpose of an FC to SCSI bridge is to connect a tape library to an FC Storage Area Network (SAN).
Library changer	A robotic mechanism within a tape library that moves tape cartridges between storage shelves and tape drives.
Meta-data	Control, status, error, and file index information exchanged between backup server and backup client.
NIC	Network Interface Card. Note that EMC CLARiiON places no restrictions on the NICs used in backup servers or clients.
Restore	Replacing lost or corrupt data on a client with the data that was backed up.
Server parallelism	The total number of sessions that the NetWorker server can write to all its tape devices simultaneously.
Shared tape drive	A tape drive within a library that is dynamically and temporarily associated with a backup client. A dedicated tape drive is one that is statically and permanently associated with a backup client.
Tape library or Library	A device that houses one or more tape drives, a changer, and tape cartridges.

Backup Configurations

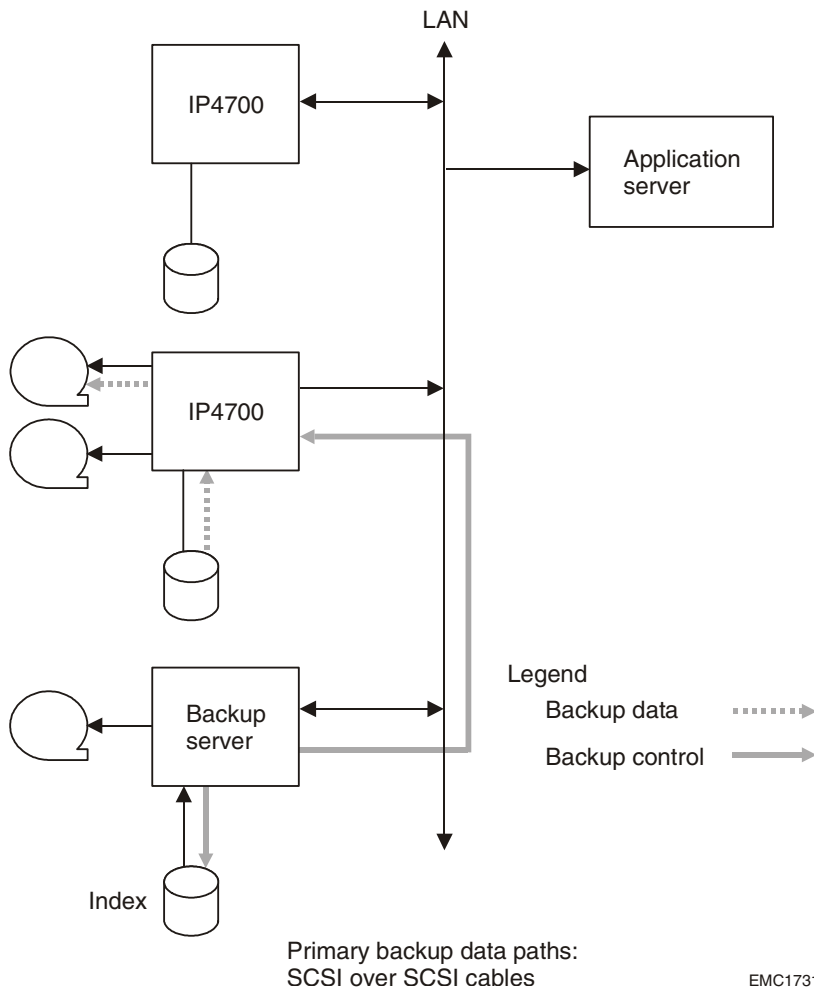
This section lists all the configurations and components that EMC CLARiiON® backup and restore environments for network attached storage (NAS) devices support.

Each IP4700 has two storage processors (SPs). Each SP has one SCSI host bus adapter (HBA), for connection to tape drives and tape libraries. Depending on the configuration you have, each SP also has either:

- Five 10/100 Mbytes per second Ethernet connections, or
- One 10/100 Mbytes per second and one 1000 Mbytes per second Ethernet connections

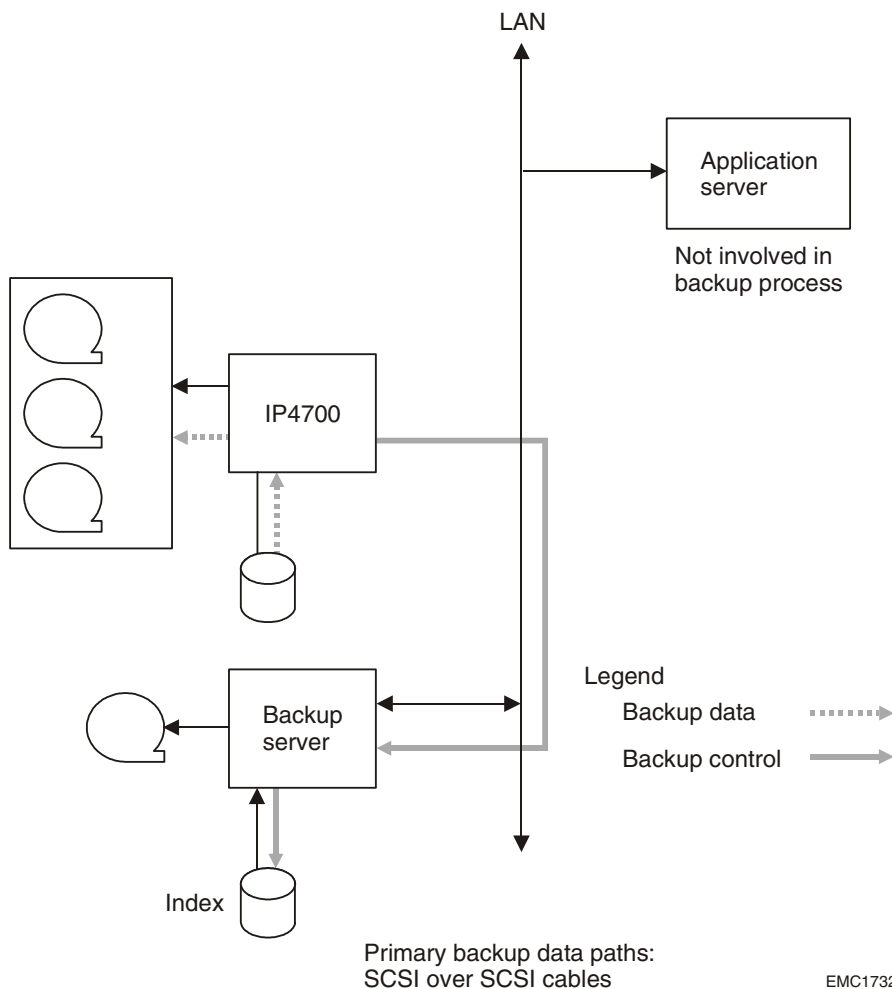
NDMP Local Backup

In an NDMP local backup configuration, shown below, zero, one, or more tape drive(s) per SP is connected directly to the SCSI HBA in the IP4700 system, and backup data flows from the IP4700 system directly to the tape drive. Using the LAN, the backup server uses NDMP to instruct the IP4700 system to perform the backup. The backup server can also back up LAN clients. The backup server still manages the index, or catalog data.



NDMP Local Library Backup

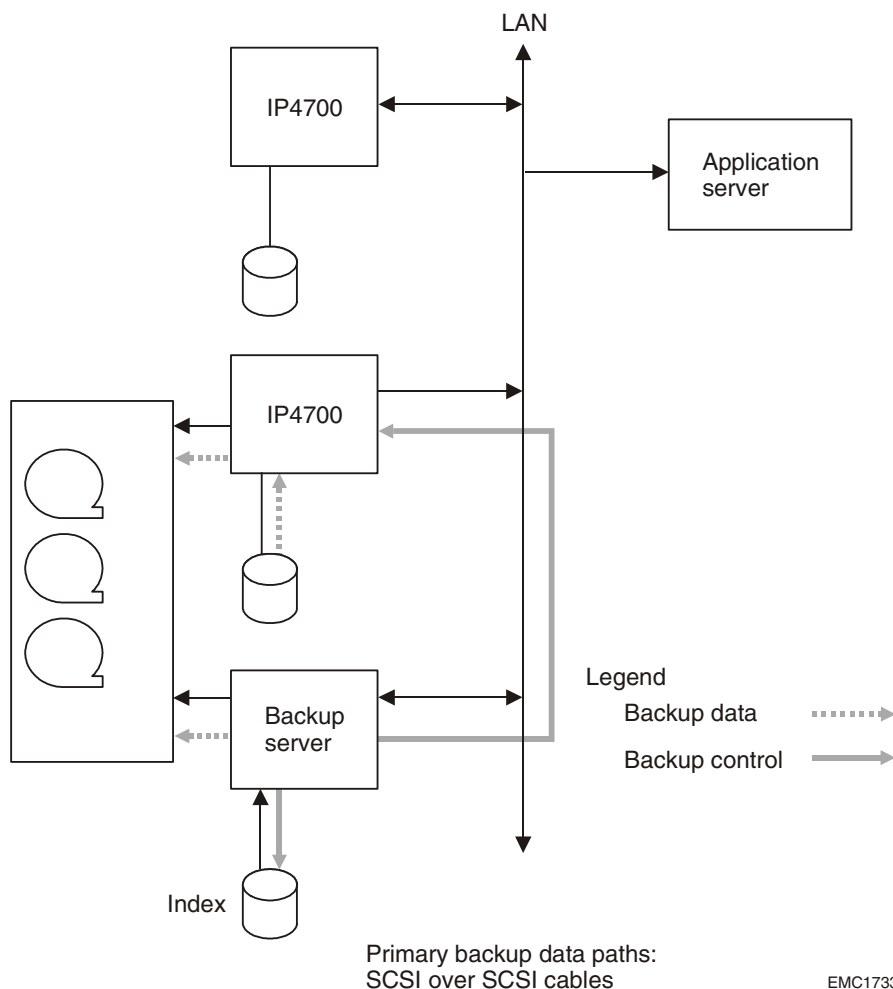
In an NDMP local library configuration, as shown below, the tape drives and the library changer device in a tape library are connected to SCSI HBAs in the IP4700 system. The backup server controls the library changer device attached to the IP4700 via a SCSI pass-through function in the IP4700 system. IP4700 backup data flows from the IP4700 system directly to the tape drive. Via the LAN, the backup server uses NDMP to instruct the IP4700 system to perform the backup. The backup server can also back up LAN clients. The backup server still manages the index, or catalog data.



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NDMP Local Shared Library Backup

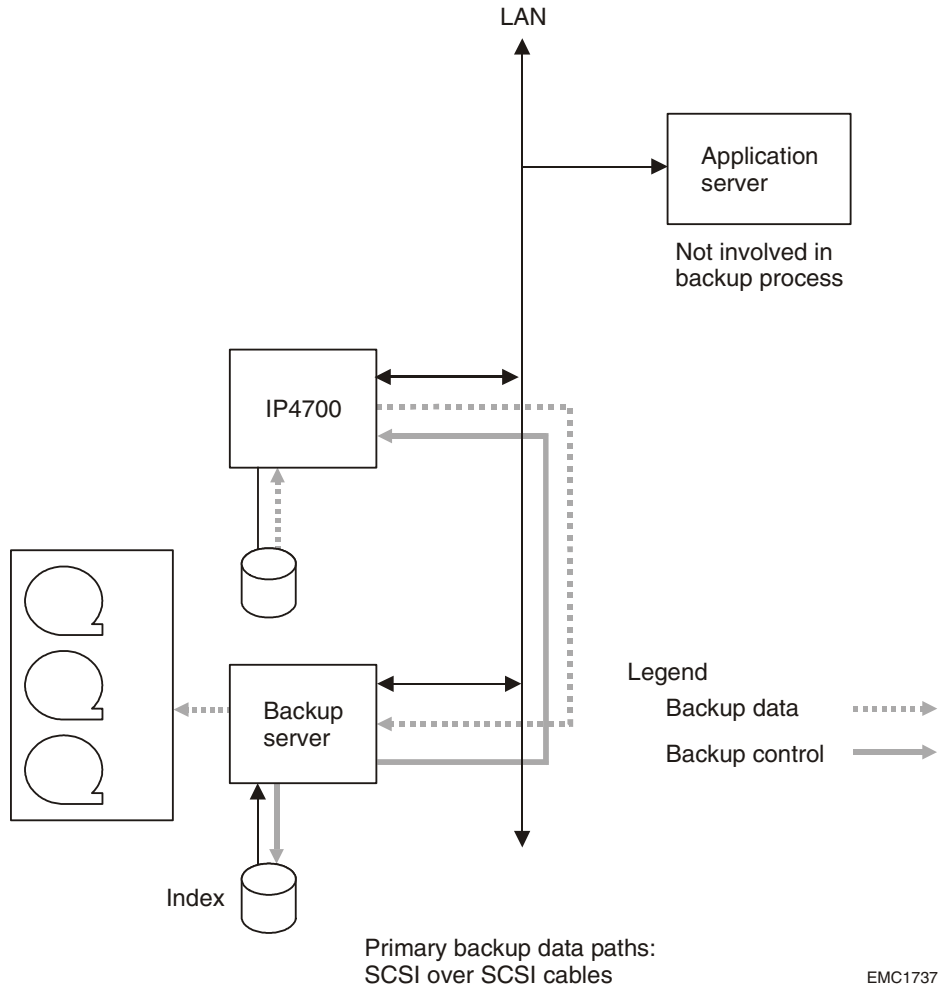
In an NDMP local shared library configuration, as shown below, one or more tape drives in a shared library are connected to SCSI HBAs in the IP4700 system. The backup server controls the library changer within the library. The backup server can also be connected to other tape drives within the library. NAS backup data flows from the IP4700 system directly to the tape drive. Via the LAN, the backup server uses NDMP to instruct the IP4700 system to perform the backup. The backup server can also back up LAN clients. The backup server still manages the index, or catalog data.



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NDMP Remote Backup

Only Legato NetWorker supports NDMP remote backup. In an NDMP remote backup configuration, a backup server directs an NDMP host to send NDMP data over the network to a backup server that writes this data to a tape drive connected to the backup server.

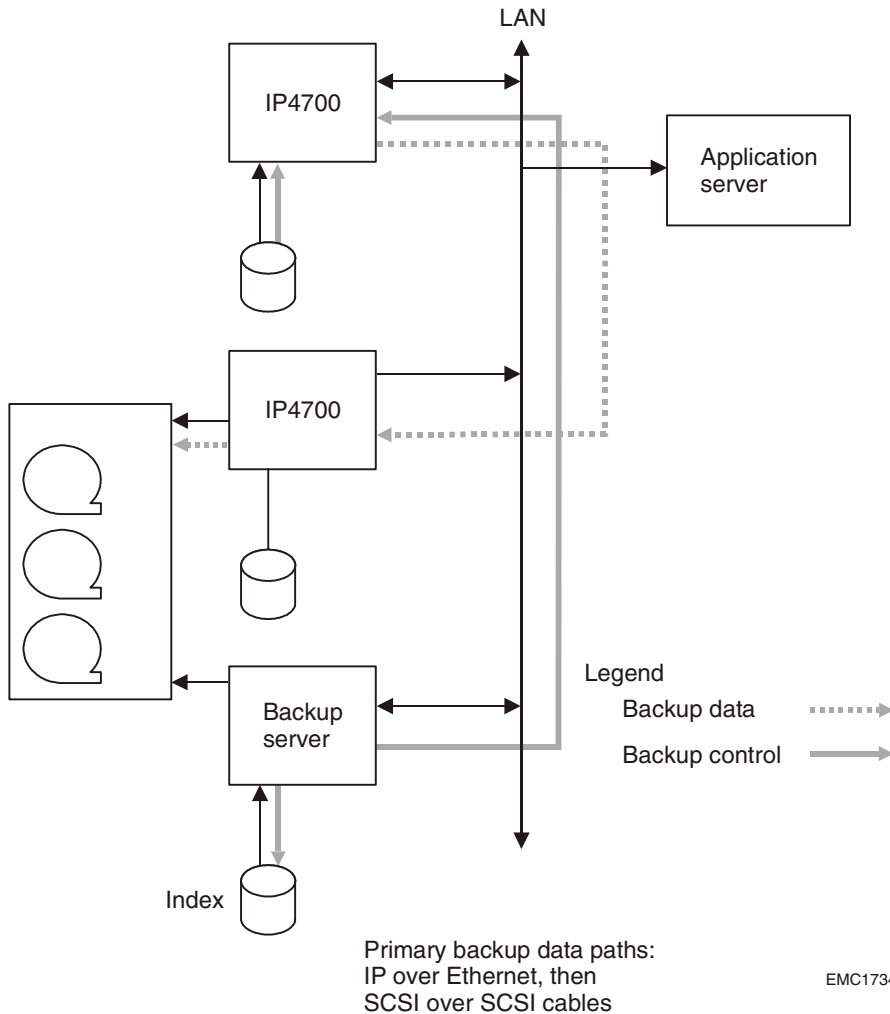


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NDMP Three-Way Backup

In an NDMP three-way backup configuration, a backup server directs one IP4700 system, without a local tape drive, to send NDMP data over the network to another IP4700 system with a local tape drive. NAS backup data flows from the primary IP4700 system, which is the device attached to the tape drive, directly to the tape drive. NAS backup data from the second IP4700 system flows, under NDMP control by the backup server, across the LAN to the primary IP4700 system, then to the tape drive. The backup server can back up LAN clients as well. The backup server still manages and stores the index, or catalog data.

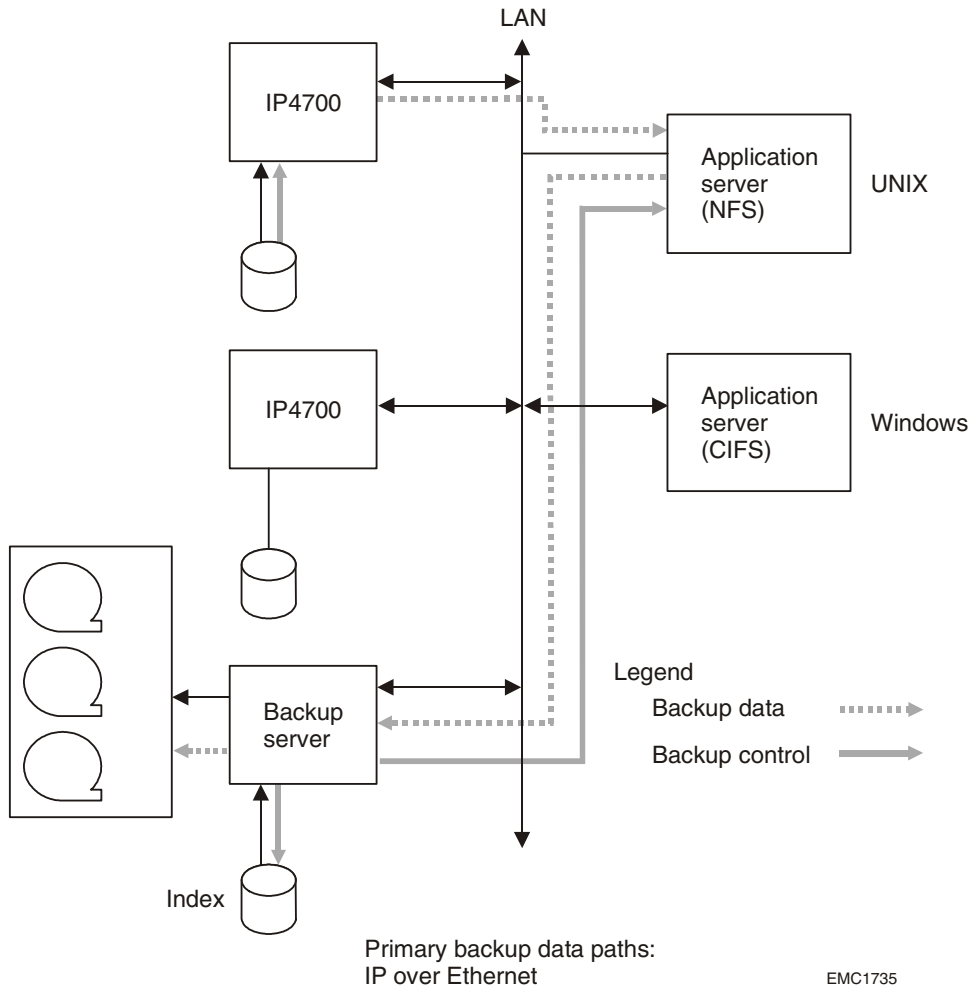
In this configuration you can use a stand-alone tape drive instead of a library drive. Also, note that within one IP4700 system, one SP can be the primary IP4700 system, and the other can be the second IP4700 system. This means that SP A could do the backup for SP B, using the mechanism described above. The following diagram shows the NDMP three-way backup configuration.



Non-NDMP NFS or CIFS-Specific Public LAN

A non-NDMP Network File Server (NFS®) or Common Internet File System (CIFS)-specific public LAN configuration, also called an IP4700 network drive backup, is similar to a standard LAN-based backup. The similarity is that the backup server communicates with the client computer systems to control the backup. It lets you back up IP4700 volumes as network drives, but at a high cost in network traffic. This backup configuration is available only with NetBackup. The main difference is that the client systems must first retrieve their

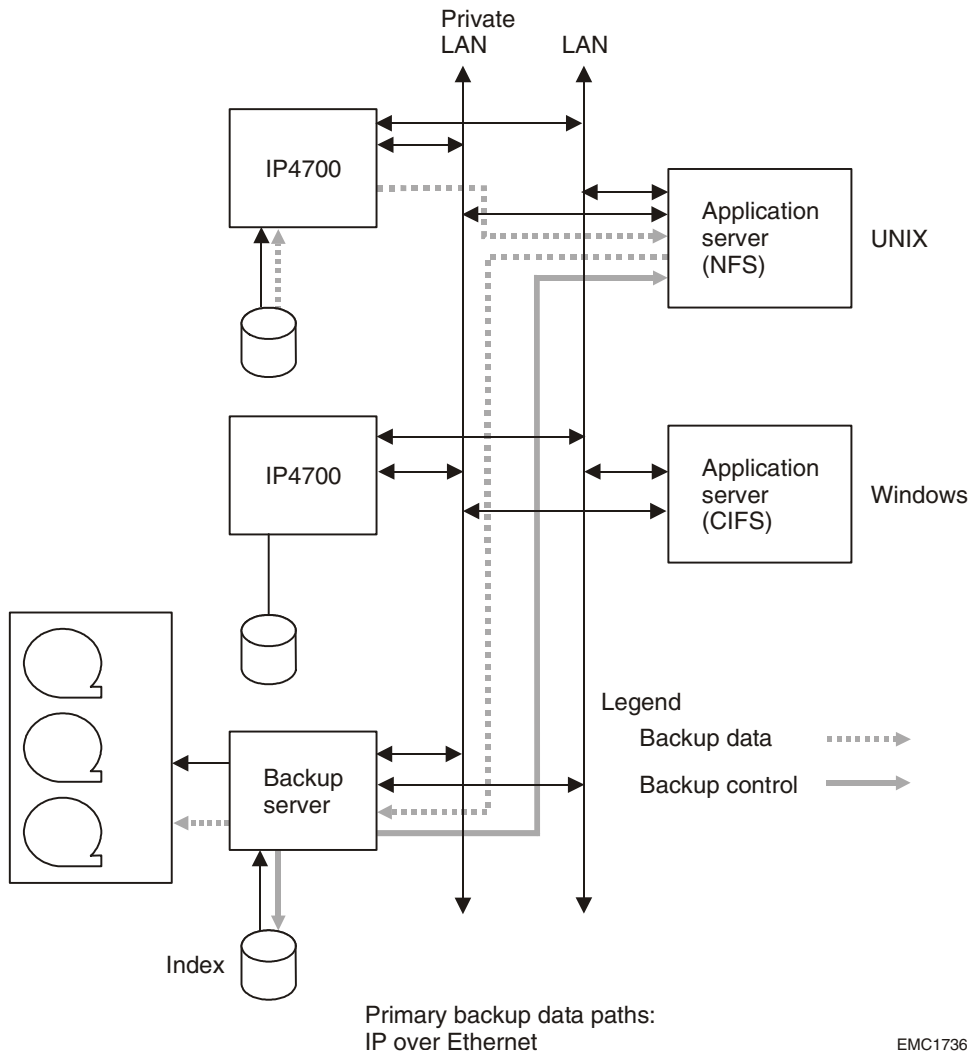
backup data from the IP4700 system and then retransmit this data to the backup server. The backup server then sends the data to the tape library. This method retains only the file system attributes that the backup client uses. Therefore, if NFS and CIFS clients usually access the backup data and the NFS client is used for backup, the CIFS attributes are lost on the backed up copy. The non-NDMP NFS or CIFS-specific public LAN configuration is shown below.



Non-NDMP NFS or CIFS-Specific Private LAN

A non-NDMP NFS or CIFS-specific private LAN configuration, also called IP4700 network drive backup, is available only with NetBackup. It is similar to a standard private LAN backup in that the backup server communicates with the client computer systems to control the backup. The main difference is that the client systems must first retrieve their backup data from the IP4700 system, and then retransmit this data to the backup server. The backup server then sends the data to the tape library. This method retains only the file system attributes that the backup client uses. Therefore, if NFS and CIFS clients usually access the backup data and the NFS client is used for backup, the UNIX® and CIFS attributes are lost on the backed up copy.

During system configuration, for best performance we recommend that you set up the mount points and file shares so that backup data flows across the private LAN. The non-NDMP NFS or CIFS-specific private LAN configuration is shown below.



Configuring Your Backup Hardware

You will need to add the devices you need to support your backup configuration. This section explains how to add standalone tape drives, local shared libraries, and local tape libraries to your IP4700 system.

Adding a Standalone Tape Drive

To use NetBackup NDMP with the IP4700 system, you must connect a tape drive directly to one of its SCSI buses. The IP4700 provides one low voltage differential (LVD) SCSI bus per SP. To each of these buses you can attach tape drives that are:

- DLT7000 single ended,
- DLT8000 single ended or LVD, or
- AIT-2 LVD.

For the most current list of tape drives that you can attach to the buses, consult your Systems Engineer.



CAUTION

Remove the IP4700 power before installing tape drives.



WARNING

Do not connect high voltage differential (HVD) drives to the IP4700. Doing so results in irreversible damage to the SCSI controller in the IP4700. Note that you can use LVD-to-HVD SCSI converter black boxes to attach HVD drives to the IP4700, but these devices are not always reliable. For a list of converters EMC has qualified, ask your Systems Engineer.

Adding a Local Shared Library

You can obtain unattended backup by connecting an IP4700 SP SCSI bus directly to a tape drive in a library that is controlled by a backup server running the Solaris®, Windows NT®, or Windows® 2000 operating systems.

Be sure to use an LVD/SE-to-HVD SCSI bus converter if the drive in the library is differential (HVD).

Adding a Local Tape Library

To use a tape library connected directly to an IP4700 SP's SCSI bus, you need the following:

- IP4700 1.1 software
- an LVD/SE-to-HVD SCSI bus converter if the drive in the library is differential (HVD)

For more information about the LVD/SE-to-HVD SCSI bus converter, refer to the *IP4700 Quick Start Guide*.

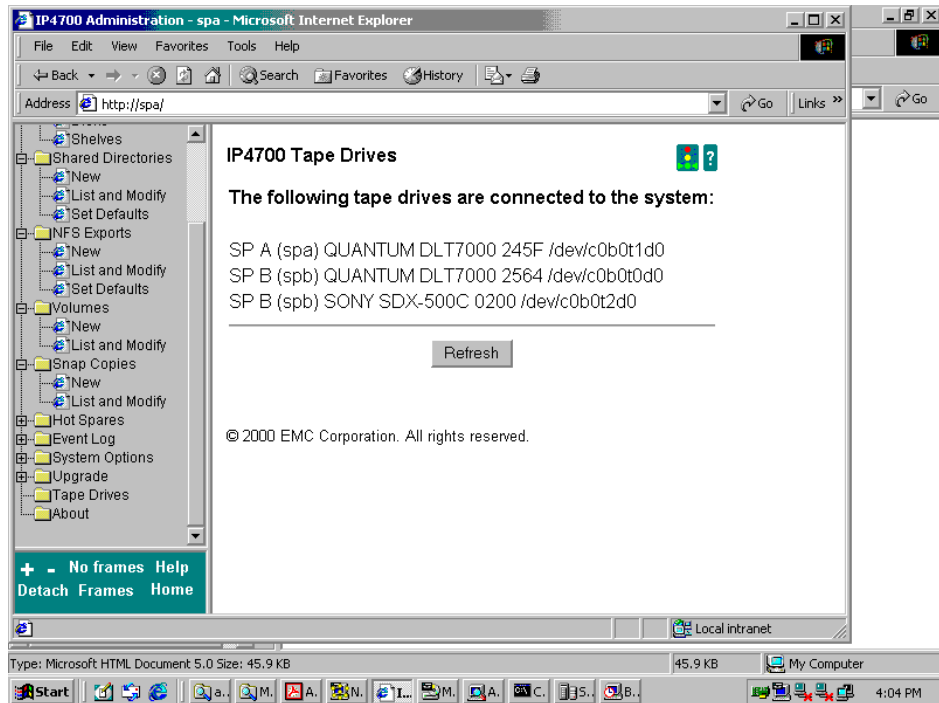
A tape library contains as many SCSI devices as there are tape drives, as well as the library changer or "robot." Depending on the library, you can configure devices on the SCSI buses as appropriate for your requirements. Usually the robot shares a SCSI bus with drives because it does not require high bandwidth. Also, usually no more than two tape drives are on a SCSI bus; otherwise, performance tends to decrease. For example, the library can have a robot at ID 0 and two drives at IDs 1 and 2 on the first SCSI bus, and tape drives with IDs 3 and 4 on the second SCSI bus. Also, the first SCSI bus may be connected to SP A and the second one to SP B.

Verifying Tape Drive or Library Connection

Once you have connected the tape drive, verify that the SP recognizes it by following these steps:

1. Turn on the IP4700.
2. In the IP4700 Administration screen, click **Tape Drives**.

The IP4700 Administration screen displays the tape drives or libraries that are connected to the system, as shown in the following example.



This example shows one DLT7000 drive on SP A and two tape drives on SP B, one DLT7000 and one AIT-2. SP A's drive has Quantum firmware V95; whereas, SP B's DLT has Quantum firmware V100. The AIT-2 drive has firmware 2.00.

As long as the screen displays the tape drives, you can use them; however, the tape drive report does not guarantee that the tapes will write and read properly. When the IP4700 system comes up and scans the SCSI buses to locate tape drives, the SCSI commands it runs do not perform synchronous SCSI transfer.

Configuring Veritas NetBackup Software

This section describes how to configure Veritas NetBackup software for standalone tape drives, local tape libraries, three-way backup, and mapped network drive backup. It also describes the SnapView and Fast Incremental features that you can use with backup.

The following table defines some key NetBackup concepts.

Concept	Definition
Storage unit	A collection of standalone tape drives or drives in a tape library that have similar characteristics.
Robot	A tape library.
Master server	A server that retains the catalog or index of backed up files. The master server controls all backups.
Media server	A system with direct access to tape drives for backup.
Robot control host	A system that controls the SCSI robot device. It is usually the same as the master server.
Sessions	Each session is a stream of backup data from a particular source. Interleaving data from multiple sessions on tape provides better use of tape drive, server, and network bandwidth.
Client	The system being backed up. A client can be an NDMP host, a master server, a media server, or a system on the network.
Class	The overall backup policy for a particular client or group of clients. A class includes attributes, clients, files, and schedule.
Attributes	General characteristics of the backup such as required storage unit, type of backup, and whether or not it is active.
Files	The files to back up. Usually they are the logical disks or mount points of file systems. They can include directives such as when to specify all local disks or when to add NDMP parameters.
Schedule	The type of backup (full or incremental) and when to run it.
Full backup	A backup of all files that you specify in the class.
Cumulative incremental	A backup of only those files that have changed since the last full backup.
Differential incremental	A backup of only those files that have changed since the last full or incremental backup.

Configuring NetBackup for Standalone Tape Drives

This section describes how to set up an NDMP login and create a device, storage unit, and class when configuring NetBackup for standalone tape drives. It also describes how to test the tape drive and perform a test backup after you have configured the NetBackup software.

Setting Up an NDMP Login

You must inform NetBackup how to log in to the NDMP hosts. For each IP4700 SP, set up the NDMP login as follows:

1. From the UNIX prompt, type **cd *install_path*/volmgr/bin**, or from the Windows prompt, **cd *install_path*\volmgr\bin**.
install_path is where the Veritas NetBackup software is installed.
2. Type **set_ndmp_attr -auth *hostname username***.
Hostname is the host name you defined for the SP, and *username* is the NDMP user you defined on the IP4700.

The NDMP username is always **Administrator**, no matter what name the administrative account uses. The NDMP account password is the same as the IP4700 administrative password. It cannot be a null password.

3. At the prompts for the password, type the password for the IP4700 administrative account.
4. To verify proper authorization, type **set_ndmp_attr -verify *hostname***

If the server can log in to the IP4700, the message, *login successful* appears. If not, make sure you have used the correct user name and password.

Continue the NetBackup configuration by creating the device, storage unit, and class, using the NetBackup graphical user interface.

Creating a Device

To create a device, follow these steps:

1. From the NetBackup Administration window, click **Media and Device Manager**.
2. From the **Media and Device Management NetBackup** window, select **Actions → New Drive**.

3. In the **Add Drive** window, make sure that the NetBackup master server is listed as device host, and specify the following:
 - a. In the **Drive Type** field, select the correct drive for your configuration, for example, DLT or 8mm Cartridge.
 - b. In the **Drive Name** field, type a descriptive name for the drive, for example, **dlt-1**.
 - c. In the **Device Name** field, specify *hostname:drivename*, where *hostname* is the host name of the SP, and *drivename* is the drive name obtained by clicking **Tape Devices** in the IP4700 graphical user interface.

The following example shows the possible configuration of a drive on SP B.

4. Click **OK**.

Creating a Storage Unit

A storage unit is simply a collection of similar tape drives. To create a storage unit, follow these steps:

1. From the NetBackup Administration window, click **Storage Unit Management**.
2. Select **Storage Unit → New**.

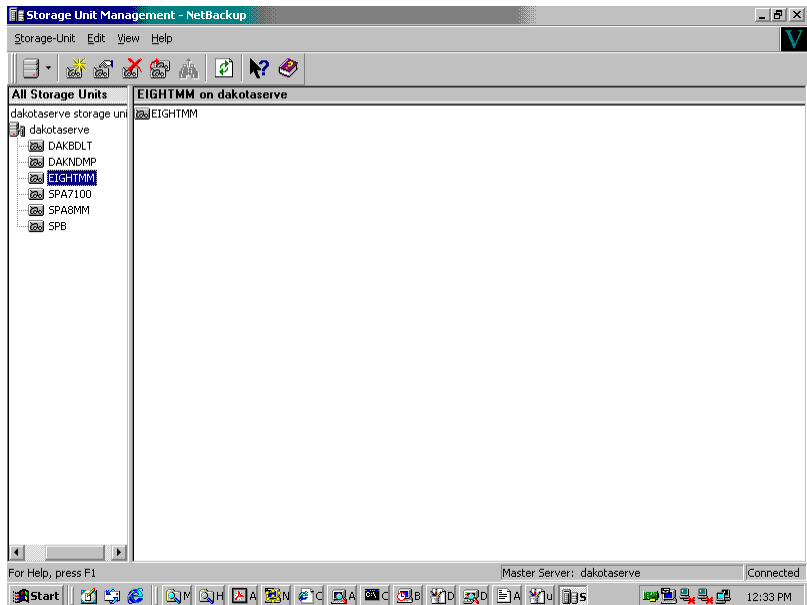
3. At the **Add a New Storage Unit** prompt, type a name for your storage unit.

In the name, indicate the type of storage unit you are creating, for example, **PC_name_DLT_SU1**. The **Add New Storage Unit** window appears.

4. In the **general properties** window, select **NDMP** as the storage unit type.

5. Click the **Storage Unit Type Properties** tab, and then:
 - a. make sure that the correct NetBackup media server is in the NetBackup media server field.
 - b. Make sure that the storage unit lists the same type of tape drive you selected when you created the device in the previous section, for example, 8mm Cartridge.
 - c. If using a robot, make sure that the correct robot type is indicated.
 - d. Click **OK**.

In the **NetBackup Storage Unit Management** window, you can see the new storage unit you created, as shown in the following example.



Creating a Class

To create a class for the standalone tape drive, follow these steps:

1. From the **NetBackup Administration** window, click **Backup Policy Management**.
2. Select **Class** → **New Class**.
3. When prompted to add a new class, type a name for the class, for example, **user_backups**.

The **Add New Class** window appears, where you will specify the attributes, schedules, backup files, and clients for the class.

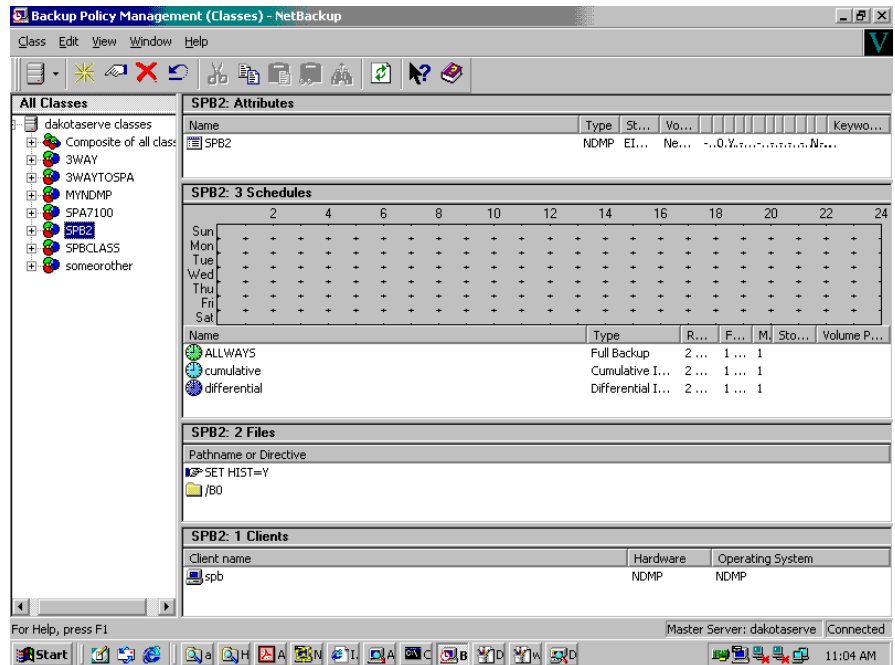
4. In the **Add New Class** window, select the **Attributes** tab, and make sure that the class type is **NDMP**.
5. In the **Host Name** tab, specify the hostname for the client, and make sure that it is the type **NDMP**.
6. In the **Files** tab, specify the name of the IP4700 volume, for example, **/A0**, that you want to back up.

The preceding slash and the case are important in the volume name.

7. In the **Schedules** tab, click the **New** button, and specify the scheduling information, including whether to do just full or full and Fast Incremental backup, and if the latter, choose cumulative as well as differential.

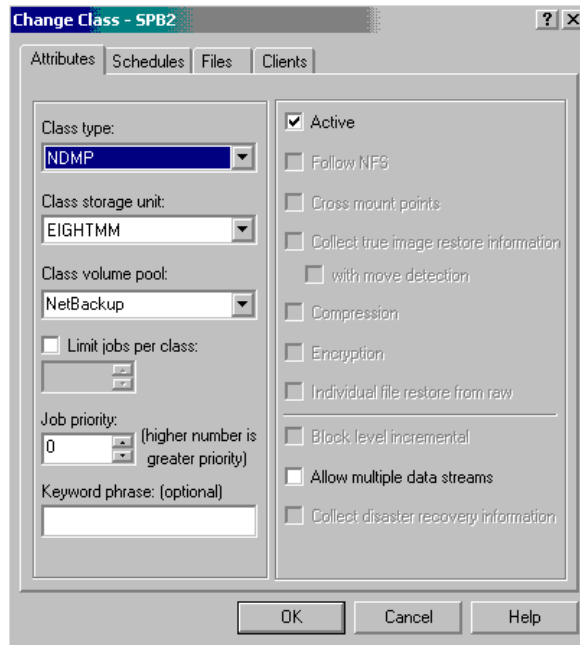
For definitions of these backup types, see the table of NetBackup concepts. Fast incremental backups take less time than full backups, but usually take longer to restore files because they require more than one tape.

The Backup Policy Management window looks something like the following.



The SET HIST=Y line in the files definition of the class is superfluous because the NDMP HIST variable is set to Y by default. You can set it to N to disable the NDMP host from sending file history information to the backup server. In this case, you cannot restore file by file.

8. After you complete the information in the **Add New Class** window, double-click the class name to open the class attributes.
9. From the drop-down list box for the class' storage unit, change the any available default selection to the specific storage unit that contains your tape drive(s), for example, EIGHTMM (as shown below).



You can have only one NDMP backup session running on a given IP4700 SP at a time because only one NDMP session is supported in the IP4700 software.

Testing the Tape Drive

Now that you have configured the NetBackup software for a standalone tape drive, test the tape drive to make sure it works properly by following these steps:

1. From the NetBackup Administration window, click **Device Monitor**.

The Device Monitor displays your configured drives.

2. If the drive state is AVD, meaning that the drive is enabled, or UP, click the drive row and then right-click and select **DOWN Drive** from the menu.

The drive control column changes to DOWN.

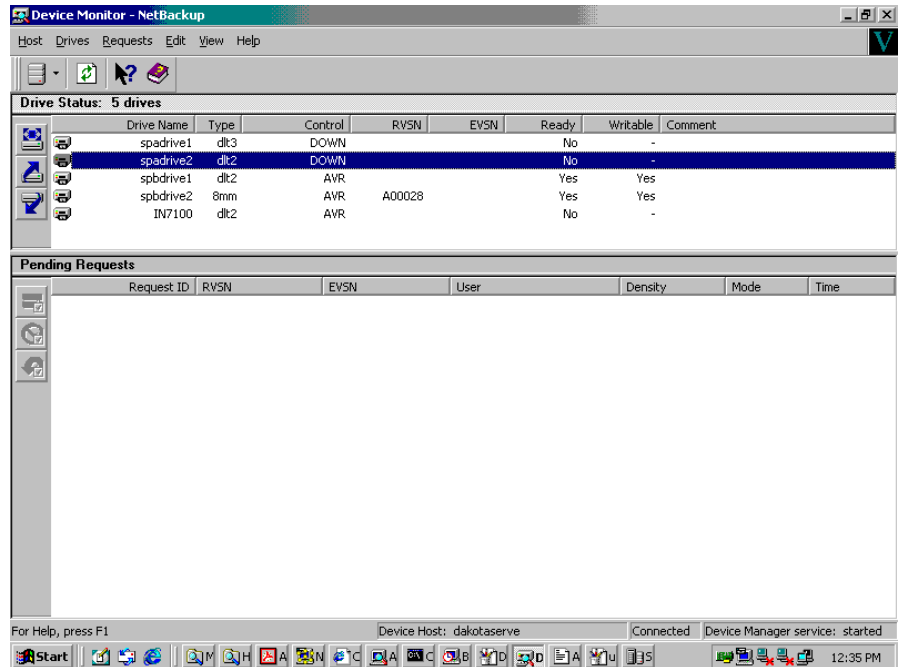
- a. If a popup window appears indicating that the request has been queued, recheck the network condition.

- b. Click the drive row again, and then right-click and choose **UP Drive** to enable the drive.

Within a few seconds the tape drive's "busy" or "in use" LED (depending on the drive type) should flash as NetBackup reads the first block to determine the tape label. In another few seconds the drive LEDs should stop flashing, and the Device Manage columns for the drive's Ready and Writable state indicate "Yes," and the drive state remains as AVD.

- c. If you do not see these results, make sure you have the correct tape drive; if you have more than one, put tapes in all the drives. Then diagnose cabling or NDMP login problems.

The following sample Device Monitor window indicates some helpful information that may not be evident at first.



The following table explains the states shown above.

State	Reason
The first two drives are DOWN.	Assuming everything else is set up properly, this usually indicates a hardware problem. In this case these two drives were removed from the SCSI bus.
The third drive is ready and writable, but no media ID is listed.	A blank tape is in the drive.
The fourth drive is ready and writable, and the media ID is listed.	The drive contains a previously written NetBackup tape.
The last drive is not ready, but is not DOWN.	No tape is in the tape drive.

Performing a Test Backup

Now that you have configured NetBackup for your standalone tape drive, it is a good idea to perform a test backup by following these steps:

1. From the **Backup Management Policy** window, click the class you just created, and then select.
2. From the pull-down menu, select **Class → Manual Backup**.

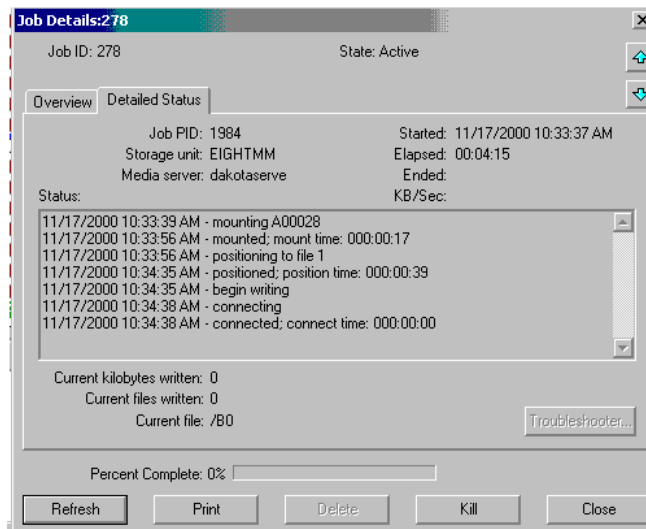
The Manual Backup window displays the schedules and class available for backup.

If Manual Backup is not selectable, make sure that the backup class is active. To do this, highlight the class, then right-click and choose **change**. Make sure that the **Active** box is checked.

3. Click the full type of backup, and then click **OK**.

You can check the backup progress by selecting the **Activity Monitor** from the NetBackup Administration window. The tape drive is active for a few seconds as the tape label is verified and possibly written, but tape activity may stop for a few minutes as the internal backup command in the IP4700 begins processing. If the volume contains a lot of data, you may want to alter the class' files so that you back up only a small folder (directory). The backup should finish with status code 0, meaning good status. When completed (successfully or not), the tape is unloaded.

4. To see details, double-click the line, and then select the Detailed Status tab to see further information about the progress of the job, including transfer rate, as shown below.



Troubleshooting

The following table lists some of the more common error codes you may see if various problems occur. It also explains each error code and suggests what you can do to resolve it.

Error Code	Cause	Action
219	<p>The specified storage is not available, or all drives in the required storage unit are DOWN.</p> <p>Note: Sometimes the cause of this error is unrelated to tape drives.</p>	<p>Stop and restart the NetBackup daemons using stoptltd, then tltd. If that does not correct the error, reboot. Also, inspect the state of the drive(s) in Device Manager.</p> <p>On a Solaris system, create a directory, /usr/openv/netbackup/logs/bpsched and try another backup.</p> <p>On a Windows system, create a folder, Install_Directory\Veritas\Netbackup\logs\bpsched, increase the log level to 12 by selecting Start → Configure from the NetBackup main screen, right-click the master server, select read/write options, select the troubleshooting tab and increase the debug level to 12 by entering a new value, and then start a new backup.</p> <p>Examine the log file in the bpsched directory to determine the problem. Refer to the appropriate NetBackup troubleshooting documentation for more information.</p>
213	<p>No storage unit is available. Basically, this is the same cause as error 219, but you selected "Any available storage unit" in the class' attributes, rather than a specific one.</p>	<p>Select a specific storage unit in the class attributes screen.</p>

Error Code	Cause	Action
96	<p>No media is available.</p> <p>If the media was previously used, this error may indicate that NetBackup has frozen the tape or otherwise marked it as full.</p>	<p>Make sure there is a tape in the drive, and the drive state is AVD, as indicated by the Device Manager.</p> <p>Assuming the data on the tape is not required, allow NetBackup to use the tape by specifying bpmedia -unfreeze -ev <i>media_id</i>, where <i>media_id</i> is the ID assigned to the tape by NetBackup. Also try forcing NetBackup to reuse the tape by specifying bpexpdate -d 0 -ev <i>media_id</i>.</p>
84	Write error.	<p>View the system event log on Windows systems for a tape drive error reported at the same time this error code occurred. This is a Medium error. If you have a DLT, another cleaning light at the front of the problem drive is lit. Either the drive needs to be cleaned, or more likely the drive encountered a transient error it cannot recover from; therefore, it reports the error and turns on the cleaning light. This is a fatal error for NetBackup, and leaves the drive in a DOWN state. Assume that the error is transient and try again. Put the drive in the UP state. If it does not return to this state (TLD for DLT libraries and AVD for standalone drives), the drive may be bad. If other drives are also DOWN, this indicates a more serious problem, such as loss of the fibre-SCSI bridge. If only one drive is down, wait until no backups are active and cycle library power to try to bring the drive back. If the drive still contains a tape, in the Device Monitor window, click the drive, and then click the reset icon. The tape should be returned to its slot. If error code 84 repeats soon, compare the problem tape drive and tape media ID (bar code). If errors recur on a certain tape, discard the tape when data on it is no longer needed. If errors recur on a certain drive with different media, replace the drive if the errors occur frequently enough to disrupt backups.</p>
99	NDMP error. You specified a volume to back up that does not exist on the IP4700.	<p>Make sure you have correctly spelled the volume name and that it begins with a forward slash (/). Otherwise, this is an internal error. In this case, try to back up a small directory you create and populate with a few files. If this backup is successful, it may indicate a problem in the IP4700 file history.</p>

Sometimes NetBackup cannot successfully use tapes. The tapes may be in another format and cannot overwrite them. You can specify that NetBackup overwrite them. On a Windows system, from the main GUI, select **Start → Configure NetBackup**. Right-click the master server, select **Read/Write Properties** from the expanded menu, select the **Media** tab, and then click all the overwrite options. On a Solaris system, add to the **bp.conf** file, the following line:

ALLOW_MEDIA_OVERWRITE = TAPE_FORMAT_TYPE.

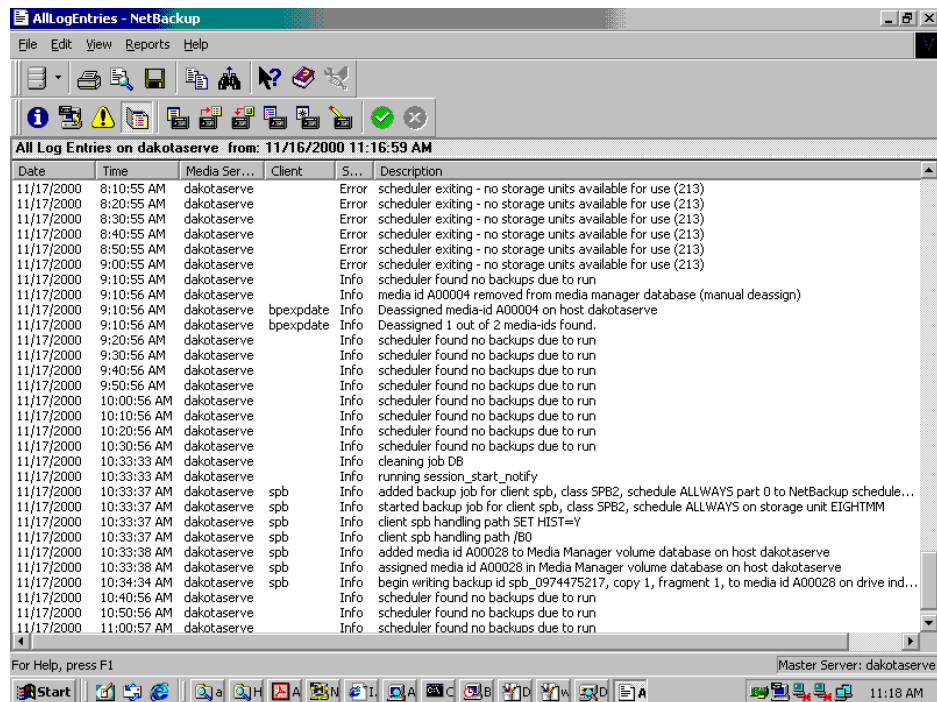
For more information about allowing overwriting on a Solaris system, refer to the *NetBackup Administrator Guide for UNIX Servers*.

Running NetBackup Reports

To troubleshoot NetBackup problems, follow these steps run a report:

1. From the main NetBackup screen, select **Reports**.
2. Select **File → New**, and click **All Log Entries**.
3. Click **Run**.

The result looks something like this.



If the report does not indicate a cause of the problem, the various logs may. For information about how to turn logging on, refer to the

NetBackup troubleshooting documentation. In the server's **Global NetBackup Attributes** screen, you can reduce the length of time logs are retained; otherwise, your system may run out of space.

If there is a problem that you have not been able to resolve, you can create additional log files to further investigate the problem. In the **volmgr/database** directory, create a file called **ndmp_debug**, and using the text editor, type **65535** in the file. Also, create the directory, **netbackup/logs/ndmp**.

Configuring NetBackup for Local Shared Libraries

When you set up the local shared library and create the drive, follow these steps:

1. In the **NetBackup Create Drive** screen, check the box, **Drive is in a robotic library**; then in the **Robotic drive information** section, select the robotic library and drive number; and click **OK**.
2. Using the procedure for setting up the device, storage unit, and class, create the storage unit and class.

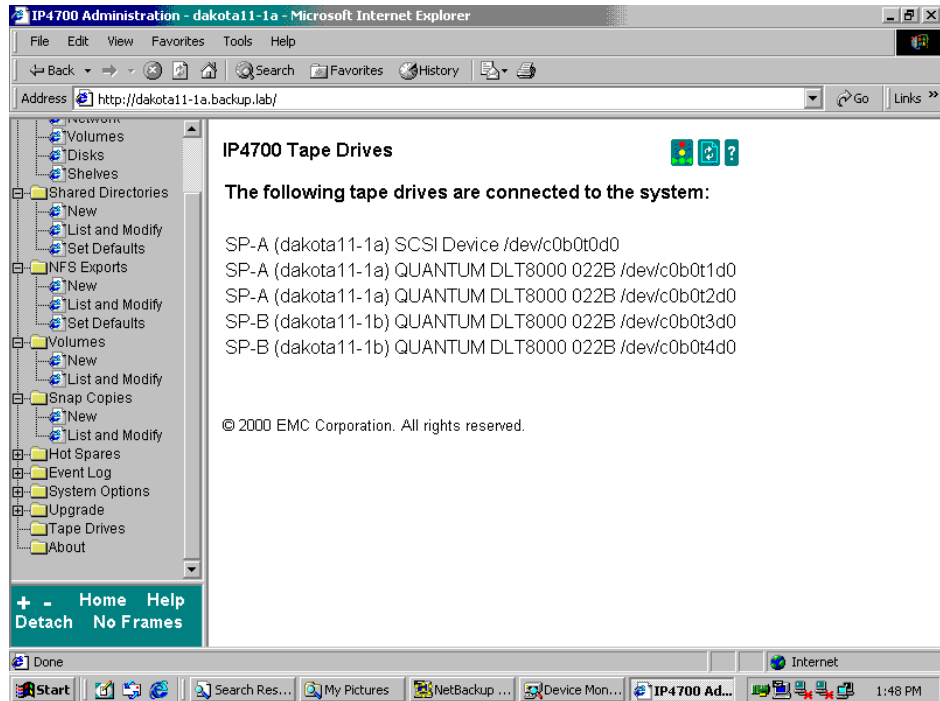
Configuring NetBackup for Local Tape Libraries

To configure NetBackup for local tape libraries, follow these steps:

1. Set up NDM logins on both SPs.
2. To inform NetBackup about the robot, type **set_ndmp_attr -robot ndmp-server-host robot-device 0 scsi-id 0**.

ndmp-server-host is the hostname of the IP4700 SP with the robot attached; the *robot-device* is the device name of the robot from the **IP4700 Administration** window; and *scsi-id* is the SCSI ID of the robot. The last three arguments are not used. For the robot in the example in the following window, the command is **set_ndmp_attr -robot dakota11-1a /dev/c0b0t0d0 0 0 0**.

When you click **Tape Drives** in the **IP4700 Administration** window, you will see all five devices reported, as shown in the following example.



In this example, the library controller (the robot) and two drives are on SP A; the other two drives are on SP B.

- To determine whether your hardware and software configurations are okay, run **set_ndmp_attr -verify**.

This process attempts NDMP login the same way it does for standalone tape drives, opens the robot device, sends a SCSI Inquiry command to it, and reports information similar to that in the following example.

```
C:\Program Files\VERITAS\Volmgr\bin>set_ndmp_attr -verify dakota11-1a
Connecting to host "dakota11-1a" as user "Administrator"...
Waiting for connect notification message...
Opening session with NDMP protocol version 2...
Host info is:
  host name "dakota11-1a"
  os type "StackOS"
  os version "Test Release: 2.7.1c"
  host id "00000000"
  host supports TEXT authentication
Logging in using TEXT method...
Login was successful
Opening SCSI device "/dev/c0b0t0d0"...
Setting SCSI target controller 0 id 0 lun 0...
Inquiry result is "ADIC      Scalar 100      1.021.02.0002      "
```

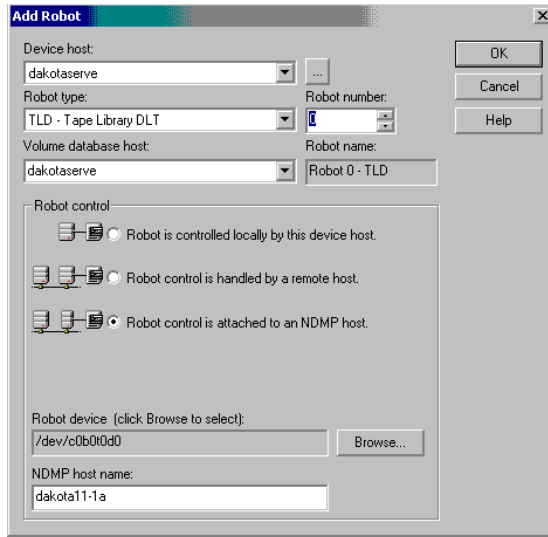
4. If the NDMP login is unsuccessful, refer to the section on setting up an NDMP login for standalone tape drives.
5. If the robot is not opened, make sure that it is turned on and that the IP4700 user interface reports it. If not, reboot the SP and try again.

Adding the Robot to NetBackup

We recommend that you add the robot before adding the drives because the drive definitions ask for the robot number. To add the robot, follow these steps:

1. In the **Media and Device Management** window, select **Actions** → **New** → **Robot**, and fill in the Add Robot window, shown below.

The Device host and Volume database host can be the hostname of your NetBackup Master Server or its own media server.



2. Select the robot type as TLD for a DLT library or TL8 for an 8mm library.

The robot number is global across the NetBackup configuration; therefore, select an appropriate number if the backup system already has one or more libraries.

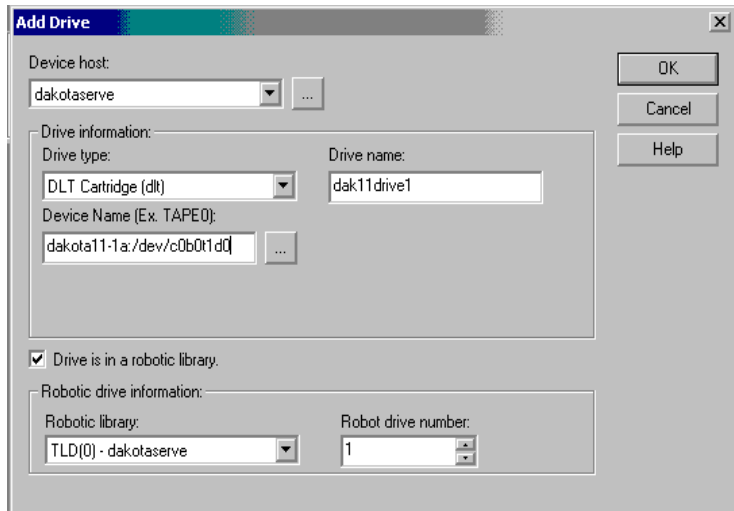
3. Click the **Robot control is attached to an NDMP host** radio button.
4. In the **NDMP host name** field, type the IP4700 SP's hostname.
5. Click **Browse**. The **Robot** popup window appears.
6. In the **Robot Device** field, type the device name for the robot, for example, `/dev/c0b0t0d0`.
7. Click **OK**.
8. In the **Add Robot** window, click **OK**.

Adding Drives to NetBackup

To add a drive, follow these steps:

1. From the **Media and Device Management** window, select **Actions → New → Drive**.

The **Add Drive** window appears, as shown in the following example.



2. Select the device host, which is your NetBackup Master Server.
3. Select the drive type that is appropriate to the robot type (DLT drive for a TLD robot, and 8mm drive for TL8 robot).
4. Type any name you want for the drive name.
5. For the device name, type *ndmp-hostname:tape-drive*, the same as for standalone drives.
6. Check the box, **Drive is in a robotic library** since this drive is in a library.
7. Select the robot library.

In the example above, the **0** in **TLD(0)** indicates robot 0.

8. Select the drive number within the robot.

For now, assume that the library is set up in a logical way, so that tape drive ID **x** is Robot drive number **x**. You add the second drive to NetBackup the same way you did the first, except that the device has **/dev/c0b0t2d0**, and the drive number is **2**. Setting up the third and fourth drives is similar to the first two and continues in a logical order, except that the NDMP hostname is **dakota11-1b**.

Testing the Library

To make sure there is communication with the robot, follow these steps:

1. In the **Media and Device Management** window, right-click the robot, and select **Inventory**.
2. Click **Inventory Robot**.
3. Click **Start**.

Within about 15 seconds the robot contents should scroll by. This display lists each slot and whether it is empty or full and shows the bar code label of the tape (if present). We strongly recommend that you use bar codes on library tapes. Some libraries (for example, ATL and ADIC) come with bar code labels that you can affix to tapes, but some library vendors, such as STK and Qualstar, offer them as an option. If your tapes are bar coded, NetBackup assigns the bar code to the media ID. If your tapes do not have bar codes, NetBackup chooses media IDs as it does for standalone drives. This works well only if you never move tapes within the library and never remove them from the library.

- a. If the Inventory works fine, run the inventory again, this time selecting **update library contents**, then **Start**.
- b. If the Inventory does not work properly, run the robot test program, **tsdtest -r robot -d1 drive** where **robot** is the *ndmp-hostname:robot-devicename*, and **drive** is *ndmp-hostname:drive 1-devicename*. Once the robot test program comes up, type a question mark (?) to see a list of supported commands. The test program is interactive; if the library reports an error, the test program tries to interpret the error as closely as it can. The problem resolution may be simple; you may have to put the library on line from its front panel.

The following are some **tsdtest** commands you can use:

- **inquiry** to obtain device information.
- **s s** to read slot status.
- **s d** to read slot and drive status.

The following example of running the robot test program shows some of these commands

```
C:\Program Files\VERITAS\Volmgr\bin>tsdtest -r dakota11-1a:/dev/c0b0t0d0 -d1 dakota11-1a:/dev/c0b0t1d0
```

```
Opening C:\Program Files\VERITAS\Volmgr\database\ndmp.dakota11-1a._dev_c0b0t0d0
```

```
Enter tsd commands (? returns help information)
```

```
?
```

To exit the utility, type q or Q.

```
init          - Initialize element status
mode          - Mode sense
m <from> <to> - Move Medium
s <type>      - Read element status
inquiry       - Display Vendor and Product ID
pos <to>      - Position to a slot
allow         - Allow magazine [un]load
prevent       - Prevent magazine [un]load
```

<from> <to> specifies drive (d#) or slot (s#)

NOTE - slot # is 0 - n (1 - n if not Quantum DLT Stacker), drive # is 1

<type> = (d)rive or (s)lot

SCSI commands:

```
unload <drive> - Issue SCSI unload
```

<drive> = d1 drive 1

```
inquiry
```

```
Inquiry_data: ADIC  Scalar 100  1.02
```

```
s s
```

```
slot 1 (addr 4096) contains Cartridge = yes
slot 2 (addr 4097) contains Cartridge = yes
slot 3 (addr 4098) contains Cartridge = no
slot 4 (addr 4099) contains Cartridge = no
slot 5 (addr 4100) contains Cartridge = no
slot 6 (addr 4101) contains Cartridge = yes
slot 7 (addr 4102) contains Cartridge = no
slot 8 (addr 4103) contains Cartridge = no
slot 9 (addr 4104) contains Cartridge = no
slot 10 (addr 4105) contains Cartridge = no
slot 11 (addr 4106) contains Cartridge = no
slot 12 (addr 4107) contains Cartridge = no
slot 13 (addr 4108) contains Cartridge = no
slot 14 (addr 4109) contains Cartridge = no
slot 15 (addr 4110) contains Cartridge = no
slot 16 (addr 4111) contains Cartridge = no
slot 17 (addr 4112) contains Cartridge = no
slot 18 (addr 4113) contains Cartridge = no
slot 19 (addr 4114) contains Cartridge = no
slot 20 (addr 4115) contains Cartridge = no
slot 21 (addr 4116) contains Cartridge = no
slot 22 (addr 4117) contains Cartridge = no
slot 23 (addr 4118) contains Cartridge = no
slot 24 (addr 4119) contains Cartridge = no
slot 25 (addr 4120) contains Cartridge = no
slot 26 (addr 4121) contains Cartridge = no
slot 27 (addr 4122) contains Cartridge = no
slot 28 (addr 4123) contains Cartridge = no
```

Setting Up Storage Units and Classes

You set up storage units and classes the same way you do for standalone tape drives. Refer to the sections about creating a storage unit and class for standalone tape drives. The only difference is that you need one storage unit for drives of the same type on each SP. In our example, we need a storage unit on SP A for its two tape drives and another storage unit on SP B for its two tape drives. When setting up classes, you need a class for each SP. Edit the class attributes to call out the specific storage unit defined on that SP. Then run a few test backups. For instructions on starting a manual backup, refer to the section on performing a test backup. The only difference from a manual backup initiated on a standalone drive is that the robot places a tape in a drive. If this does not occur, try moving tapes with the diagnostic command, **tsdtest**. Depending on the library, the drive's front panel may indicate that a tape is in a drive. You may hear the library controller move a tape, or the NetBackup Device Monitor may indicate a tape in a drive.

If you run a backup (class) for a client (NDMP host) that specifies a storage unit on another NDMP host, a three-way NDMP backup will occur instead of a local backup to the tape drives. You probably do not want this to occur because you have a local tape drive; however, if you do not have local tape drives on an SP, you can backup to tape drives on a different SP using three-way backup, which is described in the next section.

Configuring NetBackup for Three-Way Backup

To use NDMP three-way backup efficiently, you must specify a backup policy (class) that meets these criteria:

- The client is the NDMP host without a tape drive.
- The required storage unit is on an NDMP host with a tape drive.

Using the **set_ndmp_attr** command, make sure that both NDMP hosts, that is, both IP4700 SPs, have been set up for NDMP login. With NDMP three-way backup the NDMP hosts must resolve names on the network, which requires the IP4700 SPs to be configured properly. To ensure this, use the IP4700 management user interface and follow the recommended procedures to provide the name of a DNS or NIS server. Note that you must enter information in the Windows Domain setting even though you might not be using this feature.

Configuring NetBackup for Mapped Network Drive Backup

You can also back up IP4700 volumes as network drives, but at a high cost in network traffic. Also, this backup method does not save UNIX and Windows file attributes. Restoring a file backed up via a network drive eliminates the UNIX file attributes and vice versa. Network drive backup is not appropriate when the same IP4700 files are shared by UNIX and Windows systems. To set up NetBackup for mapped network drive backup, follow these steps:

1. Install NetBackup client software on the system that has the IP4700 volume mounted.
2. For Windows systems, on the backup server set up a class for this client system. (You can use the class wizard to do this.)

The system type is **MS-Windows-NT**; this is not an NDMP class.

3. Add the client system and system type.
4. Specify the network drive, which has been mapped to the IP4700 volume.
5. Set up a schedule.
6. After creating the class, double-click the class.
7. Click the Attributes tab, and then click **Backup Network Drives**.

The NetBackup Client service on the backup client system that has the IP4700 mapped network drive must not start up in the default system account; therefore, you must change its login so that it starts in an account that has access to the IP4700 drive share. Also, the same account must be valid on the system itself. Therefore, the installation should use the same administrative logins on the IP4700 as it does on other systems. We recommend that you have the same logins on different IP4700 systems mapped to the same system's network drives.

The account must have write access to all folders you are backing up, so that you can perform incremental backups efficiently.

Using SnapView in your backup strategy

The optional SnapView™/IP software provides support for the snap copy feature, which you can use during an NDMP backup. SnapView makes a snap image, or “moment-in-time” copy, and backs up from

the snap. The backup provides a consistent image with none of the file changes that take place during the backup.

Be sure to define enough space for the snap area. Other applications can also use the copies. Fast incremental, described in the next section, and SnapView use the same area. Up to 85% of the volume can be a reserve area. While you can define the space either initially or later, we recommend that you define it initially so that you can set it up and increase it. If you build it later, the space may not be large enough. To set up the area or to enlarge it, it must be free of data, that is, it cannot contain any snap images.

We recommend that you plan for snap images. Also, provide enough space in the snap area to accommodate changes made to files for the duration of the backup. Consider the following when sizing the snap copy areas:

- Heavy use of reads and writes
- Number of concurrent snaps
- Rate of data change
- Concurrent Fast Incremental backups

SnapView copies only the blocks that change. It moves the blocks into the snap area, which makes space for new data. For example, if you request to read block A, you will see the file as it existed at the time you copied block A to the snap save area. You can create another snap image for a later time, and can distinguish between them by the day and time, for example, Monday, 8:00. You can have up to 92 current, active snap images. You can write to the latest snap image with pointers to the earlier snap images.

To use snapView, you must turn on the snap feature in the IP4700 volume, and add the following directive before the files to back up in the class' file list.

SET SNAPSHOT=T

Be sure to spell "SNAPSHOT" correctly. If NDMP variables are misspelled, no error message appears, but the backup simply will not run as you expect.

For more information about snap copy, see the *IP4700 Administrator's Guide*.

Using the Fast Incremental Option for Backup

The Fast Incremental option reduces the backup time and makes it easy to manage and move files. The Fast Incremental option allows the IP4700 file system to retain a file that describes which files have changed. It uses this file to determine which files to back up rather than requiring meta-data for each file be read to determine when it was last modified. Thus, backups can be much faster, especially when few files have changed.

Fast incremental backups require space. As with defining snap space, you can create the Fast Incremental space initially or later. If you want to add more space later, you can dynamically add it the same way you add snap space. (See the section above.)

We recommend doing the Fast Incremental backup in an “off time” so as not to affect snap copy.

To use the Fast Incremental feature, turn on the Fast Incremental option in the IP4700 volume, and add the following directive before the files to back up in the class’ file list:

SET FAST_INCREMENTAL=T

Be sure to spell “FAST_INCREMENTAL” correctly. If NDMP variables are misspelled, you will not receive any error message; the backup simply will not run as you expect.

For more information about Fast Incremental backup, see the *IP4700 Administrator’s Guide*.

Configuring Legato NetWorker Backup Software

This section describes how to configure the Legato NetWorker backup software for standalone tape drives, local tape libraries, three-way backup, and remote backup. It explains how to configure the client resource and the pool resource and how to test the backup. It also describes how to use the SnapView and Fast Incremental options in your backup strategy.

Configuring Standalone Tape Drives

For every standalone tape drive (not in a jukebox) that will receive a backup from the IP4700, create a device resource with the following values:

- **Name:** use `rd=systemname:devicename`, where *systemname* is the name of the system with the tape drive attached to it (either an IP4700 SP or a NetWorker system), and *devicename* is the name of the device on that system. To find out the name of the device on an IP4700 system, use the IP4700 web administration program and look in the Tape Drives area.
- **Media type:** Type **DLT7000** or **AIT-2**, as appropriate.
- **Target sessions:** **1**.
- **NDMP:** **yes**.
- **Remote user and Password:** The username and password of the system with the tape drive. For an IP4700, set it to **Administrator** and the IP4700's password. If it is a tape drive on a NetWorker system with NetWorker SnapImage module, set it to the username and password established by running the command `/usr/ndmp_home/ndmp_passwd` on the NetWorker system.

After running `ndmp_passwd`, you must restart the NetWorker SnapImage module daemon. One way to do this is by restarting `inetd`.

To configure tape drives in a jukebox, follow the `jbconfig` procedure below. For more information about `jbconfig`, refer to the *Legato Command Reference Guide* or the `jbconfig` man pages.

Configuring a Local Tape Library

To configure NDMP for a local tape library, run the `ndmpjbconf` and `inquire` programs:

```
%/etc/LGTOuscsci/ndmpjbconf
```

The following Legato example guides you through the prompts.

```
Enter NDMP Server name: ? dakota11-2a
```

```
Enter NDMP user name: ? Administrator
```

```
Enter NDMP Jukebox handle: ? /dev/c0b0t1d0
```

```
Both 'ndmpjbconf_dakota11-2a' file and 'ndmpjbconf'
default file are created in '/usr/lib/nsr.'
```

```
%/etc/LGTOuscsci/inquire -N standard
```

```
Using '/usr/lib/nsr/ndmpjbconf' default config
file.
```

If you want to use different NDMP jukebox configuration file, use `-f` option, or set the environment variable `LGTO_NDMP_LIBSCSI_CONFIG_FILENAME` to the path of the NDMP jukebox config file.

Enter 'Administrator' password on NDMP host 'dakota11-2a' (characters will not be echoed):

Communicating to devices on NDMP Server 'dakota11-2a', this may take awhile...

Note: we cannot retrieve device file names for NDMP devices.

```
scsidev@1024.1.0:ATL P1000 62200502.01      |Autochanger
                                           (Jukebox)
scsidev@1024.2.0:QUANTUM DLT7000          245F|Tape
scsidev@1024.3.0:QUANTUM DLT7000          245F|Tape
scsidev@1024.4.0:QUANTUM DLT7000          245F|Tape
scsidev@1024.5.0:QUANTUM DLT7000          245F|Tape
scsidev@1024.7.0:Adaptec 2940B U2         |Processor
```

If the **inquire** program (above) matches the devices seen in the IP4700 Administration web program Tape Devices section, proceed by running the **jbconfig** program.

%jbconfig

- 1) Install a SmartMedia Jukebox.
- 2) Install an Autodetected SCSI Jukebox.
- 3) Install an Autodetected NDMP SCSI Jukebox.
- 4) Install an SJI Jukebox.
- 5) Install an STL Silo.

What kind of Jukebox are you installing? [1] **3**

Enter NDMP Server name: ? **dakota11-2a**

Enter NDMP user name: ? **Administrator**

Enter NDMP password (characters will not be echoed):

Enter NDMP jukebox handle: ? **/dev/c0b0t1d0**

What is the NDMP type of 'dakota11-2a'?

- 1) One of the Standard NDMP Servers.
- 2) NetApp or Celestra HP.

Choice? **1**

Communicating to devices on NDMP Server
'dakota11-2a', this may take awhile...

These are the SCSI Jukeboxes currently attached to
your system:

1) scsidev@1025.1.0: Standard SCSI Jukebox, Vendor
<ATL>, Product <P1000 6220050>

Which one do you want to install? **1**

Installing an 'Standard SCSI Jukebox' jukebox.

Name you would like to assign to the jukebox
device? **ATLP1000**

A brief description of the jukebox device?
[scsidev@1025.1.0: Standard SCSI Jukebox] **4 drive, 30 slot**

Pathname of the control port for the jukebox
device? [scsidev@1025.1.0]

Do you want automated device cleaning support
enabled? (yes/no) **yes**

Enter hostname that owns media drive 1: ? [sunnw]
dakota11-2a

Enter pathname of media drive 1: ? **/dev/c0b0t2d0**

using 'rd=kadota11-2a:/dev/c0b0t2d0' as device name

Should the drive be configured as a NDMP device?
(yes/no) **yes**

This media device has not been configured yet.
Please select a media device type for
rd=dakota11-2a/dev/c0b0t2d0.

- | | |
|-------------------|-----------------|
| 1) 3480 | 22) sdlt |
| 2) 3570 | 23) tz85 |
| 3) 3590 | 24) tz86 |
| 4) 4890 | 25) tz87 |
| 5) 4mm | 26) tz88 |
| 6) 4mm 4GB | 27) tz89 |
| 7) 4mm 8GB | 28) tzs20 |
| 8) 4mm 12GB | 29) tkz90 |
| 9) 4mm 20GB | 30) dst (NT) |
| 10) 8mm | 31) dst |
| 11) 8mm 5GB | 32) dtf |
| 12) 8mm 20gb | 33) himt |
| 13) 8mm AIT | 34) LTO Ultrium |
| 14) 8mm AIT-2 | 35) qic |
| 15) 8mm Mammoth-2 | 36) SD3 |
| 16) 9490 | 37) vhs |
| 17) 9840 | 38) SLR |
| 18) dlt | 39) VXA |
| 19) dlt1 | 40) file |
| 20) dlt7000 | 41) logical |
| 21) dlt8000 | 42) optical |

Choice? **20**

Enter hostname that owns media drive 2: ? [sunnw]
dakota11-2a

Enter pathname of media drive 2: ? **/dev/c0b0t3d0**

using 'rd=kadota11-2a:/dev/c0b0t3d0' as device name

Should the drive be configured as a NDMP device?
(yes/no) **yes**

This media device has not been configured yet.
Please select a media device type for
rd=dakota11-2a/dev/c0b0t3d0.

- | | |
|-------------|--------------|
| 1) 3480 | 22) sdlt |
| 2) 3570 | 23) tz85 |
| 3) 3590 | 24) tz86 |
| 4) 4890 | 25) tz87 |
| 5) 4mm | 26) tz88 |
| 6) 4mm 4GB | 27) tz89 |
| 7) 4mm 8GB | 28) tzs20 |
| 8) 4mm 12GB | 29) tkz90 |
| 9) 4mm 20GB | 30) dst (NT) |

- | | |
|-------------------|-----------------|
| 10) 8mm | 31) dst |
| 11) 8mm 5GB | 32) dtf |
| 12) 8mm 20gb | 33) himt |
| 13) 8mm AIT | 34) LTO Ultrium |
| 14) 8mm AIT-2 | 35) qic |
| 15) 8mm Mammoth-2 | 36) SD3 |
| 16) 9490 | 37) vhs |
| 17) 9840 | 38) SLR |
| 18) dlt | 39) VXA |
| 19) dlt1 | 40) file |
| 20) dlt7000 | 41) logical |
| 21) dlt8000 | 42) optical |

Choice? **20**

Enter hostname that owns media drive 3: ? [sunnw]
dakota11-2a

Enter pathname of media drive 2: ? **/dev/c0b0t4d0**

using 'rd=dakota11-2a:/dev/c0b0t4d0' as device name

Should the drive be configured as a NDMP device?
 (yes/no) **yes**

This media device has not been configured yet.
 Please select a media device type for
 rd=dakota11-2a:/dev/c0b0t4d0.

- | | |
|-------------------|-----------------|
| 1) 3480 | 22) sdlt |
| 2) 3570 | 23) tz85 |
| 3) 3590 | 24) tz86 |
| 4) 4890 | 25) tz87 |
| 5) 4mm | 26) tz88 |
| 6) 4mm 4GB | 27) tz89 |
| 7) 4mm 8GB | 28) tzs20 |
| 8) 4mm 12GB | 29) tkz90 |
| 9) 4mm 20GB | 30) dst (NT) |
| 10) 8mm | 31) dst |
| 11) 8mm 5GB | 32) dtf |
| 12) 8mm 20gb | 33) himt |
| 13) 8mm AIT | 34) LTO Ultrium |
| 14) 8mm AIT-2 | 35) qic |
| 15) 8mm Mammoth-2 | 36) SD3 |
| 16) 9490 | 37) vhs |
| 17) 9840 | 38) SLR |
| 18) dlt | 39) VXA |
| 19) dlt1 | 40) file |
| 20) dlt7000 | 41) logical |
| 21) dlt8000 | 42) optical |

Choice? **20**

Enter hostname that owns media drive 4: ? [sunnw]
dakota11-2a

Enter pathname of media drive 2: ? **/dev/c0b0t5d0**

using 'rd=dakota11-2a:/dev/c0b0t5d0' as device name

Should the drive be configured as a NDMP device?
 (yes/no) **yes**

This media device has not been configured yet.
 Please select a media device type for
 rd=dakota11-2a/dev/c0b0t5d0.

- | | |
|-------------------|-----------------|
| 1) 3480 | 22) sdlt |
| 2) 3570 | 23) tz85 |
| 3) 3590 | 24) tz86 |
| 4) 4890 | 25) tz87 |
| 5) 4mm | 26) tz88 |
| 6) 4mm 4GB | 27) tz89 |
| 7) 4mm 8GB | 28) tzs20 |
| 8) 4mm 12GB | 29) tkz90 |
| 9) 4mm 20GB | 30) dst (NT) |
| 10) 8mm | 31) dst |
| 11) 8mm 5GB | 32) dtf |
| 12) 8mm 20gb | 33) himt |
| 13) 8mm AIT | 34) LTO Ultrium |
| 14) 8mm AIT-2 | 35) qic |
| 15) 8mm Mammoth-2 | 36) SD3 |
| 16) 9490 | 37) vhs |
| 17) 9840 | 38) SLR |
| 18) dlt | 39) VXA |
| 19) dlt1 | 40) file |
| 20) dlt7000 | 41) logical |
| 21) dlt8000 | 42) optical |

Choice? **20**

Your jukebox does not report that it has a bar code reader, but it does report that it can handle volume tags. Some jukeboxes that have bar code readers report this way. If your jukebox has a bar code reader, do you want bar code reader support enabled? (yes/no) **yes**

Do you want volume labels to match bar code labels?
 (yes/no) **yes**

Following are attributes that define cleaning cartridge support for the jukebox 'ATLP1000':

```

auto clean: Yes
default cleanings: 20
cleaning slots: 30

```

cleaning cartridge volumes	Slot number
Cleaning tape (20 uses left)	30

Make sure that the slots set aside for cleaning cartridges contain cleaning cartridges. NetWorker must know the number of times it can use each cleaning cartridge. You can control how many times NetWorker will use each cleaning cartridge by using the command:

nsrjb -U (number of uses) -S (slot number)

For more details please refer to nsrjb man pages.

Following are attributes that define the cleaning schedule for each device in the jukebox.

```

name: rd=dakota11-2a:/dev/c0b0t2d0
  date last cleaned:
  cleaning interval: 2 weeks
  cleaning required: No
name: rd=dakota11-2a:/dev/c0b0t3d0
  date last cleaned:
  cleaning interval: 2 weeks
  cleaning required: No
name: rd=dakota11-2a:/dev/c0b0t4d0
  date last cleaned:
  cleaning interval: 2 weeks
  cleaning required: No
name: rd=dakota11-2a:/dev/c0b0t5d0
  date last cleaned:
  cleaning interval: 2 weeks
  cleaning required: No

```

Verify that the values for these attributes are appropriate for your installation. If not, check documentation on how to set up automated cleaning cartridge support.

Jukebox has been added successfully.

Would you like to configure another jukebox?
(yes/no) **no**

%

Configuring Three-Way Backup

For a three-way backup, enter the name of the IP4700 SP with the tape drive that backups will be sent to in the **Storage Node** field in the client resource. Use the NetWorker Administrator program to modify this field.

Configuring Remote Backup

To perform remote backup, install and configure the Legato NetWorker SnapImage Module. During the installation, install only the NDMP Server. After the installation is complete, set the NDMP server username and password by running **/usr/ndmp_home/ndmp_passwd** on the NetWorker system.

After running **ndmp_passwd**, you must restart the NetWorker SnapImage Module. One way to do this is by restarting **inetd**.

Enter the name of the NetWorker SnapImage Module system in the Storage node field in the client resource.

Configuring the Client Resource

Using NetWorker, create a client resource with the following values (for information about how to create clients, refer to the NetWorker documentation):

- **Name:** name of the IP4700 SP

As each SP is an independent backup client, two client resources will be created for every IP4700.

- **Save set:** an explicit list of the file systems or directories that will be backed up; do **not** use the NetWorker special save set value, "All."
- **Remote access:** **root@backupserver** where *backupserver* is the name of the backup server.

- **Remote user and Password:** the username and password of the IP4700. Specify **Administrator** and the password. These fields are case-sensitive.
- **Backup command:** `nsrndmp_save -T dump`. Do not use `tar`.
- **Application information:** Type any needed NDMP environment variables. (For more information, see your IP4700 documentation.) The following table lists the NDMP environment variables to use with NetWorker. For more NDMP setup information for NetWorker, see your NetWorker documentation.

NDMP Environment Variable	Valid Parameters	Default Value	Use
TYPE	Tar or dump	tar	Do not specify as an environment variable; specify this in the Backup command field.
PREFIX	Directory	/	Do not specify as an environment variable; specify this in the Save sets area.
FILESYSTEM	Directory	/	Do not specify as an environment variable; specify this in the Save sets area.
FILES		.	Do not specify as an environment variable; specify this in the Save sets area.
HIST	T/F or Y/N	T	Do not specify as an environment variable unless you do not want to create history, which we do not recommend.
MOUNT	T/F or Y/N	F (unless SNAPSHOT=T or FAST_INCREMENTAL=T)	Do not use since all mount points are created at the root file system level in an IP4700 file system.
LEVEL	0 to 9	nonincremental	Do not specify as an environment variable since NetWorker passes the level used in the schedule resource set in the client.

NDMP Environment Variable	Valid Parameters	Default Value	Use
NO_ACLS	T/F or Y/N	F	Do not use this environment variable. If you do, backups will not save access control list information for either CIFS or NFS file systems. We do not recommend using this variable.
SNAPSHOT	T/F or Y/N	F (unless FAST_INCREMENTAL=T)	If you use this, ensure that the volume has snapshot enabled in the IP4700 web interface. (In Volume... List and Modify, select a volume, click Properties , check Snap copy , and click Update .)
FAST_INCREMENTAL	T/F or Y/N	F	If you use this, ensure that the volume has Fast Incremental enabled in the IP4700 web interface. (In Volume... List and Modify, select a volume, click Properties , check Fast Incremental , and click Update .) Note: Snap copy must be enabled in order to use Fast Incremental.

- **NDMP:** Select **Yes**.
- **Storage nodes**
 - For a local backup, enter the SP's name.
 - For a three-way backup, enter the name of the SP with the tape drive that will receive the backup.
 - For a remote backup, enter the name of the NetWorker system with the tape drive and that is running the NetWorker SnapImage Module software.

Configuring the Pool Resource

NetWorker cannot write NDMP and non-NDMP data to the same tape volume. Also, the backup of the NetWorker Server cannot be written via NDMP. Therefore, you need at least two pools.

Using NetWorker Administrator, create a pool resource with the following values:

- Name: **IP4700**, **NDMP**, or some other appropriate value
- Pool type: **Backup**
- Clients: Add the names of each of the IP4700 SPs.

- **Devices:** Select all the NDMP devices that will receive IP4700 backups.

Next, create a schedule. Make sure that incremental backups are not selected; these will result in full backups. Use level 1 through level 9 backups instead. For more information on levels, refer to your NetWorker Administrator's Guide.

Testing the Backup

After adding backup to your IP4700 system, you can make sure that everything is operating properly by doing the following:

- Run a backup
- Run a restore

Running a Backup

To run a backup follow these steps:

1. Run the NetWorker Administrator program.
2. Select the backup server.
3. Select **Create** and **new Group**.
4. In the **Name** field, type **Test** for the group name.
5. In the **Level** field, select **Full** as the level of backup.
6. In the **Retries** field, enter **1** to ensure that the backup tolerates link-down and link-up behavior that results when systems are rebooted or when network cables are disconnected and reconnected.
7. Click **OK**.
8. Follow these steps to create a client for the Test group:
 - a. Run the NetWorker Administrator program.
 - b. Select the backup server.
 - c. Select **create clients**.
 - d. In the **Name** field, type the backup server host name.


If possible, use the short host name, for example, **client1**, not the fully qualified domain name (for example, **client1.customer.com**). NetWorker automatically adds the short name and the fully qualified domain name to the alias field.

- e. Change the **Save set** field if you want, and type **A0** or **B0**, or another appropriate value.
- f. In the **Group** field, select **Test**.
- g. Click the **Preferences** tab.
- h. In the **Server Network Interface** field, add the private LAN IP name or the private LAN IP address for the adapter (if you are using private LANs).

For the private LAN IP name, use the short host name, not the fully qualified host name.

- 9. Start the **Test** group.
- 10. To view performance information for the backup, select the **Monitor** tab in the main **NetWorker Administrator** window.
Under **Devices** you will see how much of each tape the system is using; under **Sessions** you will see all the sessions currently backing up; and under **Messages** you will see any information that NetWorker has reported.
- 11. View the status of a backup when it is running, has finished, or has failed.
- 12. From the **NetWorker Administrator** window, select **Groups**.

The system flags each group with one of the following icons:

- ? = group has never run a backup.
- ! = last backup was successful.
- X = part or all of the last backup failed.
-  = the backup stopped in the middle of the run.

- 13. For information about the last backup a group performed, select **Group Details**.

You can find further details in NetWorker's log files, which are in the **D:\nsr\logs** directory where NetWorker was installed. See the following log files:

Filename	Description
daemon.log	contains the NetWorker actions with time stamps, such as when a backup started and when it ended. You can copy daemon.log to another file and open it with WordPad.
messages	describes each client in each backup when the backup completes.
savegrp.log	provides information on every group that finished successfully or unsuccessfully.

14. Wait for the backup to complete.

Running a Restore

To perform restores on the backup server, which has just been backed up, use normal NetWorker tools. For more information about these, refer to your NetWorker documentation.

Troubleshooting

If you encounter error codes, refer to Legato's *Error Message Guide* for more information about its meaning and resolution.

SnapView

For information about the SnapView feature, refer to Chapter 7 of the *IP4700 Administrator's Guide*. To enable the SnapView feature:

- Enable Snap Copy on the volume, using the IP4700 Administrator Volumes menu.
- Add **SNAPSHOT=T** to the Application Information section of the NetWorker client resource for the IP4700.

Fast Incremental Option

For information about the Fast Incremental feature, refer to Chapter 3 of the *IP4700 Administrator's Guide*. To enable the Fast Incremental feature:

- Enable Snap Copy and the Fast Incremental option on the volume, using the IP4700 Administrator Volumes menu.
- Add the following to the Application Information section of the NetWorker client resource for the IP4700:
 - **SNAPSHOT=T**
 - **FAST_INCREMENTAL=T**

Best Practices

This section lists some recommended practices for backup; they apply to various systems, including Windows and UNIX systems as well as the IP4700 system. The following are general practices that we recommend:

- When connecting a tape library, do not reserve a SCSI channel for the autochanger device. Since the autochanger receives much less data than the tape drives, put the autochanger on the first SCSI bus, along with that SCSI bus' tape drives.
- Put no more than two DLT 7000 HVD devices on a single SCSI bus. The bus runs at a maximum rate of 20 Mbytes per second, and each DLT 7000 can write at considerably more than the drive's rate of 5 Mbytes.

Automatic Synchronization

Since backup software depends on accurate and consistent system times on the backup client and backup servers, we recommend that you run automatic time synchronization software on every system. Platform-specific information follows:

- The standard time synchronization protocols are Network Time Protocol (NTP) and Simple Network Time Protocol (SNTP).
- Windows 2000, Windows NT, and UNIX operating systems use SNTP.
- Windows operating systems can have their times set from another Windows system, with member servers getting their time from the primary domain controller (PDC) server.
- Time servers exist in a hierarchy; a few systems should pull their time automatically from a time server on the Internet, and all other systems pull their time from these systems.
- You will enable automatic time synchronization on Solaris systems using the **xntpd** program.

Backing Up Over the Network

Using a Private Network

This section provides some tips for backing up over a private network.

If you are performing backups over a network, we recommend that you use a private network dedicated to backups. This provides the

best backup and restore performance, and does not degrade the network performance of the clients while backup or restore is occurring.

We also recommend that each client have a dedicated network adapter, either 100 Mbytes per second or 1000 Mbytes per second, that is connected to the private network. Some adapters and/or operating systems do not support link aggregation. If two Gigabit Ethernet adapters are in the same network, you must specify which Gigabit Ethernet adapter you want the backup server to use when backing up a client. Refer to your backup software documentation for information about specifying this. We recommend that you plan ahead to evenly distribute the network traffic throughout the two Gigabit network adapters.

Naming the Private Network LAN IP

Since both the backup server and all the backup clients have connection to the public/corporate network, the corporate Windows Internet Name Service (WINS) or Domain Name System (DNS) servers manage the name resolutions. You do not need to set up a name resolution mechanism in the private network, but we recommend that all private network LAN IP names have the same prefix or suffix for easy administration. For example, if the client's public hostname is **client1**, the private network LAN IP name should be **BUCclient1** or **client1BUC**.

Using Bar Codes in the Jukebox



CAUTION

Do not place anything else on a tape cartridge. Sticky labels on the tape may come off inside the tape drive, requiring repair that is not covered under warranty.

These machine-produced bar codes with characters you can read make it easy to find a particular cartridge if you need to. They also significantly reduce the amount of time it takes the jukebox to come on line when power is restored or a door is closed due to bulk loading. They also speed up the backup server inventory operation because the bar code label is read through the jukebox SCSI interface, which identifies a tape even if the physical location within the

jukebox has changed. Otherwise, the backup software must put each tape into a drive in order to identify a tape.

Tape Handling

Do not affix labels to any part of the tape cartridge other than the bar code. Such labels can fall off inside the drive and damage it. “Swallowed leaders” can result when a loop on the end of the leader in the DLT tape cartridge has been damaged or worn. Catastrophic damage can also occur to a DLT tape cartridge if it is dropped from a height of three feet or more. Loading such a tape into a DLT drive will result in a swallowed leader, and the drive will need servicing. You can test a dropped tape by loading and unloading ten times in a standalone DLT tape drive.

Monitoring your Backup Performance

Several factors affect backup performance. When your backup server was installed, the System Engineer verified the backup throughput; however, your environment may have changed over time, or certain factors may not have been considered when the System Engineer installed the backup server. This section describes some of the factors that affect backup performance. For more specific information about these factors, refer to your backup software documentation.

DLT7000 Tape Drive Performance

The most important hardware component of the backup system is the tape device. The drive itself has a native (uncompressed) throughput of 5 Mbytes per second. Depending on the exact data being recorded, the drive throughput may increase to 10 Mbytes per second or slightly more. However, when two of these drives are active on the same SCSI bus, each will attain a maximum of 8.5 Mbytes per second.

The NetWorker Administrator provides an accurate representation of each tape drive’s throughput while backing up. If you notice a drive running significantly slower than 5 Mbytes per second, investigate. Performance that is less than 5 Mbytes per second on a tape drive is acceptable if one of the following conditions exists:

- Backup had proceeded fine earlier with good performance on the drive, but now there are only one or two sessions from slow client systems.
- The tape drive has encountered a bad spot on the tape, and its throughput is momentarily reduced by write retries. Wait a minute to see if the slow throughput continues.

AIT-2 Tape Drive Performance

The AIT-2 tape drive performance is similar to the DLT7000 tape drive performance, except that the native throughput for the AIT-2 tape drive is 6 Mbytes per second, increasing to 12 Mbytes per second with very compressible data.

Disk Performance

The tape drive is often blamed for poor backup performance, when the root of the problem may actually be the disk. Older disks have slower transfer rates and slower seek times. Throughput from a client with such a slow disk may be as low as 1.5 to 2.5 Mbytes per second.

Small Files

Clients that have many small files (50 Kbytes or less) may be unable to supply data at a good rate. The disk spends more time seeking and then reading data, and throughput suffers considerably.

Compressibility of File Data

If data is already compressed, such as pre-compressed image files, the DLT7000 tape drive cannot further compress the data; thus the backup rate will slow down to a maximum of 5 Mbytes per second.

Other System Activity

A client that is busy with other applications cannot supply data for backup as fast as if only backup was running. The bottleneck could be disk I/O if there is a lot of other activity, or it could be related to the CPU. Backup reduces response time of other applications that are left running while backup occurs.

LAN Throughput

You can expect 40 Mbytes or less per second per Gigabit Ethernet LAN connection. If the networks used for backup also carry significant application network traffic at the same time, you will have less backup throughput than expected. If you want to back up during a specified time window, consider installing a dedicated backup network(s).

Session Completion

Session completion occurs when one tape drive runs much longer than the others. Sometimes this is difficult to determine. The result is that the total backup time takes longer than you think it should. For example, the backup may start fine with three sessions on each of four tape drives. The backup software may show good performance with 7.5 Mbytes per second on each tape drive. Depending on the order in which clients finish and new clients start, one client with one

session may be left at the end. If the client is slow, its low backup throughput can swamp the overall backup throughput and make the backup take longer than the backup's total size would indicate. One way to determine whether or not this is the case is to watch the backup software monitor window before you expect the backup to finish, and note whether only one tape drive runs for a significant length of time until the backup completes.

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